

REMARKS

Reconsideration and allowance of this application are respectfully requested in view of the above amendments and the discussion below.

The present invention is addressed to a sensor element and method for measuring the position of liquid in capillaries by using an arrangement of electrode pairs of insulated electrodes which are periodically positioned over a length of the sensor element. The element is then able to measure the position of liquids in capillaries and to measure the movement of the liquid in both directions either from top to bottom or from right to left.

Claims 1-3, 5 and 7 have been rejected under 37 C.F.R. §102 as anticipated by the reference to Murata et al., U.S. Patent No. 5,148,708, as indicated at item 22 on pages 4 and 5 of the Patent Office Action. Claims 4, 6, 11 and 12 have been rejected under 35 U.S.C. §103 as unpatentable over Murata, as indicated at item 24 on page 6. Claims 8 and 9 have been allowed.

Applicants respectfully traverse the rejections under 35 U.S.C. §102 and under 35 U.S.C. § 103 on the grounds that amended independent claims 1, 11 and 12 provide structure and method steps that are not available from the reference to Murata.

Each of independent claims 1, 11 and 12 have been modified to further emphasize that the electrodes are not electrically connected with each other (i.e., electrically insulated from each other). This feature serves to further distinguish over Murata wherein all the electrodes are networked with electrical connections as indicated in the Office Action at item 22 of page 5. Fig. 2 of the present

application clearly indicates that there is no electrical connection between the individual electrodes. Paragraph [0015] contains a description that only the partial electrodes of one electrode are networked with electrical connections but not the electrodes themselves.

The measuring procedure is described at paragraph [0017] which indicates that the electrodes are not electrically connected because it would not be possible for the arrangement of electrode pairs wetted by the liquid to have the same minimum resistance when the arrangement of pairs and the electrodes would be electrically connected between each other. The description at paragraph [0041], referring to Figure 5, shows the measuring procedure. The three graphs could not be measured in a such manner if the electrodes would have electrical connections with each other.

The reference to Murata is limited to the measuring of filling levels in tanks. Figs. 1 and 2 of Murata show a pair of resistance films (52a, 52b) wherein a plurality of detecting electrodes 54 are mounted intermittently in the longitudinal direction on the resistance films and are electrically connected by the resistance films as indicated at column 4, lines 21-24. The electrode 58 at its lowest position contacts the resistance films 52a, 52b as indicated at column 4, lines 12-13. Therefore, all electrodes are electrically connected by the resistance films and by the electrode 58.

As indicated previously because of the arrangement of electrode pairs of the unconnected electrodes which recur over the length of the element, the sensor of the present invention measures the position of liquids and capillaries

and measures the movement of the liquids in opposite directions or in both directions.

Therefore the sensor in Murata consists of only one electrode formed by electrically connected partial electrodes whereas the present invention involves a plurality of electrodes with each of the electrodes being formed by a partial electrodes networked with electrical connections.

Independent claim 1 provides an arrangement which allows for the possibility of measuring the movement of a bubble and a capillary in both directions and solves the problem of precise metering of small quantities of liquids and capillaries. In contrast, Fig. 9 in Murata makes it clear that the sensor of Murata is only able to measure liquid levels in tanks. If the container of Fig. 7 of Murata had a liquid in a container only at the top and if the bottom was filled by a bubble, a filled container would still be indicated because the liquid would short circuit the upper two partial electrodes. Therefore, the movement of liquid from the top in the downward direction in the container of Murata short circuits the top electrode and a full container is detected although in reality only the upper portion of the container is liquid. This sensor of Murata cannot be used in automated pipetting and the metering of small quantities of liquids.

Items 1-3 of the Patent Office Action contain objections to the claims 7, 10 and 11 which have been addressed by the above amendments.

Claims 3-4 and 17 have been rejected under 35 U.S.C. § 112, first paragraph, based on the indication that there is no support in the specification for specific items in claims 3, 4 and 17.

Applicants respectfully traverse this rejection on the grounds that the limitations concerning the distance between the electrode pairs, and the range of voltage was specifically provided in the claims of the originally disclosed German priority document. The claims constitute a part of the disclosure. One skilled in the art would know how to make and use the invention based on the disclosure including the claims. That is, the recitation in the claims of specifying an alternating current, for example, in the range of millivolts is certainly obvious to one of ordinary skill in the art given the remainder of the disclosure.

Claims 10-20 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite for the reasons indicated at item 10-20 on pages 3 and 4 of the Patent Office Action. In response to this rejection, Applicants have amended claims 10-16 and 18-20 in a manner required by the specific indications of the Office Action without adding new matter.

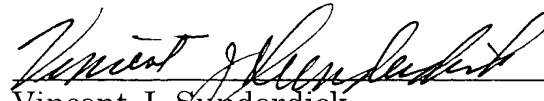
Therefore in view of the changes to the claim structure to obviate the rejections and objections under 35 U.S.C. §112 and in view of the distinguishing features between the claimed invention and the amended claims which features are not shown or disclosed or made obvious by the reference of record, Applicants respectfully request that this application containing claims 1-20 be allowed and be passed to issue.

If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

Please charge any deficiency in fees or credit any overpayments to Deposit
Account No. 05-1323 (Docket #127FR/50898).

Respectfully submitted,

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